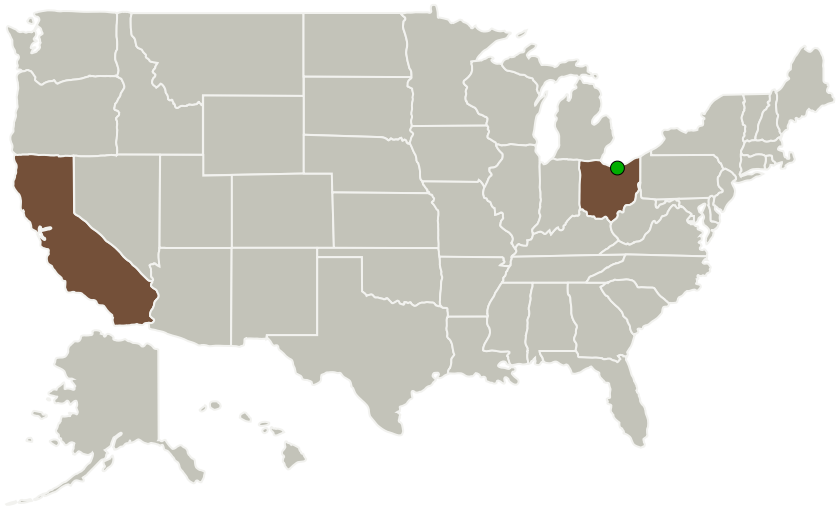
Propellant Flow Actuated Piezoelectric Rocket Engine Igniter, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

Spark ignition of a bi-propellant rocket engine is a classic, proven, and generally reliable process. However, timing can be critical, and the control logic, additional electronic components and wiring adds complexity, cost and weight. These factors can be especially undesirable for small attitude or reaction control engines. The proposed innovation uses a novel method to excite a piezo-ceramic crystal using the initiation of propellant flow to the engine. When the propellant valves are opened, the precise timing of the spark relative to propellant flow, as well as the flow start transient, are governed by the geometry of the device. Hence, precise, repeatable start conditions should be achieved with no additional control logic or complexity. Furthermore, the piezo-ceramic crystal is integral to (and embedded in) the igniter body, thereby completely eliminating external wiring and associated complexity. A bench-top demonstration of one manifestation of the device (incorporating only one very simple moving part) has already demonstrated basic feasibility. Other manifestations with no moving parts what-so-ever (at the macroscopic scale) may also be viable, and will be investigated. Phase 1 TLR advancement goal is from 3 to 5, with Phase 2 goal of 7.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Innovative Engineering Solutions	Lead Organization	Industry	Murrieta, California
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
California	Ohio

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140068)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Innovative Engineering Solutions

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mark A Wollen

Co-Investigator:

Mark Wollen

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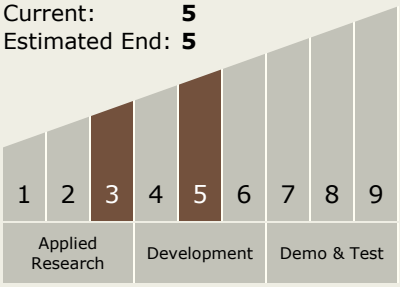
Technology Maturity (TRL)

Start: **3**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.3 Cryogenic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System